

I. AMENDMENTS TO THE CLAIMS

Claim 1. (Currently Amended) Porous hydrophilic membranes comprising a porous inert support on which an at least one ionomer is deposited, said

wherein the membranes being characterized in that they have a water permeability higher than 1 l/(h.m².Atm), preferably higher than 10 l/(h.m².Atm), more preferably higher than 100 l/(h.m².Atm), still more preferably higher than 500 l/(h.m².Atm);

and wherein the ionomer being under is amorphous form and having the hydrophilic group in the acid form comprises acid hydrophilic groups.

Claim 2. (Currently Amended) Membranes according to claim 1, having comprising pores partially or totally occluded to gases.

Claim 3. (Currently Amended) Membranes ~~having pores totally occluded to gases according to claim 1~~ claim 2, comprising pores totally occluded to gases and containing an ionomer amount higher than about 30% by weight.

Claim 4. (Currently Amended) Membranes ~~having pores totally occluded to gases according to claim 1~~ claim 2, comprising pores totally occluded to gases and containing an ionomer amount higher than about 20% by weight.

Claim 5. (Currently Amended) Membranes according to claim 1, wherein the porous inert support is formed by (per)fluoropolymers, ~~preferably PTFE, still more preferably bistretched PTFE.~~

Claim 6. (Currently Amended) Membranes according to claim 1, wherein the ionomer is a (per)fluorinated polymer preferably comprising -SO₃H and/or -COOH ~~ionomers are (per)fluorinated polymers and they preferably have SO₃H and/or -COOH, preferably SO₃H, functionality, and an equivalent weight such as to result amorphous.~~

Claim 7. (Currently Amended) Membranes according to claim 6, wherein the ionomer comprises ~~ionomers comprise:~~

- (A) monomeric units deriving from one or more fluorinated monomers containing at least an ethylene unsaturation; or
- (B) fluorinated monomeric units containing functional groups transformable into hydrophilic groups, preferably SO_2F and/or selected from the group consisting of one or more of $-\text{SO}_2\text{F}$, $-\text{COOR}$, and $-\text{COF}$, wherein R is a C_4-C_{20} C_1 to C_{20} alkyl radical or a C_6-C_{20} C_6 to C_{20} aryl radical, in such an amount as to give the above equivalent weight, the and wherein the functional groups being are converted into one or more of hydrophilic groups, preferably into $-\text{SO}_3\text{H}$ and/or or $-\text{COOH}$ groups in the final membrane if the functional groups were $-\text{SO}_2\text{F}$ and/or $-\text{COOR}$, $-\text{COF}$.

Claim 8. (Currently Amended) Membranes according to claim 7, wherein the fluorinated monomers of type monomeric units (A) are selected from the group consisting of the following:

- vinylidene fluoride (VDF);
- C_2-C_8 C_2 to C_8 perfluoroolefins, preferably tetrafluoroethylene (TFE);
- C_2-C_8 chloro and/or C_2 to C_8 chloro, bromo- and/or iodo-fluoroolefins, such as chlorotrifluoroethylene (CTFE) and bromotrifluoroethylene;
- $\text{CF}_2=\text{CFOR}_f$ (per)fluoroalkylvinylethers (PAVE), wherein R_f is a C_1 to C_6 C_4-C_6 (per)fluoroalkyl, for example trifluoromethyl, bromodifluoromethyl, pentafluoropropyl; and
- $\text{CF}_2=\text{CFOX}$ perfluoro-oxyalkylvinylethers, wherein X is a C_4-C_{12} C_1 to C_{12} perfluoro-oxyalkyl having one or more ether groups, for example perfluoro-2-propoxy-propyl.

Claim 9. (Currently Amended) Membranes according to claim 7, wherein the fluorinated monomers of type monomeric units (B) are selected from the group consisting of the following:

- $\text{F}_2\text{C}=\text{CF}-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2\text{F}$;
- $\text{F}_2\text{C}=\text{CF}-\text{O}-[\text{CF}_2-\text{CXF}-\text{O}]_n-\text{CF}_2-\text{CF}_2-\text{SO}_2\text{F}$, wherein X = Cl, F or CF_3 ; CF_3 and n = 1-10 1 to 10;
- $\text{F}_2\text{C}=\text{CF}-\text{O}-\text{CF}_2-\text{CF}_2-\text{CF}_2-\text{SO}_2\text{F}$;

- $F_2C=CF-Ar-SO_2F$ wherein Ar is an aryl ring;
- $F_2C=CF-O-CF_2-CF_2-CF_2-COF$; and
- $F_2C=CF-O-[CF_2-CXF-O]_n-CF_2-CFX-COF$, wherein X = Cl, F or CF_3 ; CF_3 and n = 4-
40 1 to 10.

Claim 10. (Currently Amended) Membranes according to claim 1, wherein the ~~ionomers contain~~ ionomer contains from 0.01% to 5% by moles of monomeric units deriving from a bis-olefin of formula:



wherein:

m = 2 to 10 ~~2-10, preferably 4-8; and~~

R_1 , R_2 , R_5 , and R_6 are equal to or different from each other, are other and are H or C_1-C_5 C_1 to C_5 alkyl groups.

Claim 11. (Currently Amended) Membranes according to claim 1, wherein the ~~ionomers comprise~~ at least one ionomer is selected from the group consisting of one or more of the following monomers:

- monomeric units deriving from TFE;
- monomeric units deriving from $CF_2=CF-O-CF_2CF_2SO_2F$;
- monomeric units deriving from the bis-olefin of formula (I); and
- iodine atoms in end position.

Claim 12. (Currently Amended) Membranes according to claim 1, wherein the amorphous ionomer shows a substantial absence of crystallinity.

Claim 13. (Currently Amended) Membranes according to ~~claim 1~~ claim 12, wherein the amorphous ionomer has a residual crystallinity lower than 5%, ~~preferably lower than~~ 4%.

Claim 14. (Currently Amended) Membranes according to ~~claim 1~~ claim 6, wherein the (per)fluorinated ~~ionomers are~~ ionomer is crosslinked.

Claim 15. (Currently Amended) Membranes according to claim 1, containing one or more amorphous or crystalline (per)fluoropolymers, wherein the amorphous ones being different from the ionomer used in the membrane (per)fluoropolymers are one or more (per)fluoroelastomers selected from one or more of the group consisting of TFE/(per)fluorovinylether copolymers, TFE/VDF/HFP, and (per)fluorovinylether.

Claim 16. (Original) Membranes according to claim 15, wherein the (per)fluoropolymers are of crystalline ionomeric type.

Claim 17. (Currently Amended) ~~Use of the membranes~~ A method of separating utilizing the membranes according to claim 1 ~~in separation processes, preferably in microfiltration and ultrafiltration processes of aqueous solutions, and in pervaporation processes.~~

Claim 18. (Currently Amended) Use The method according to claim 17, wherein the method is iperfiltration or reverse osmosis and wherein the membranes have comprise pores partially or totally occluded to gases, and contain gases and contain an ionomer amount higher than about 30% by weight, ~~and are used in iperfiltration and reverse osmosis processes.~~

Claim 19. (Currently Amended) A process for preparing hydrophilic porous membranes according to claim 1, comprising a porous support formed by a (per)fluorinated polymer, and amorphous (per)fluorinated ionomers containing hydrophilic groups, selected from the group consisting of preferably having -SO₃H or and -COOH functionality, said process comprising the following steps:

- a) ~~impregnation of~~ impregnating the porous support ~~formed by the (per)fluorinated polymer~~ with a (per)fluorinated ionomer solution in fluorinated organic solvent,
wherein:

the (per)fluorinated ionomer comprises having hydrolyzable groups, preferably selected from the group consisting of -SO₂F, -COOR, and -COF, wherein R is a C₄-C₂₀ C₁ to C₂₀ alkyl radical or a C₆-C₂₀ C₆ to C₂₀ aryl radical,

the concentration of the ionomer in the range 1% to 20% by weight, and
the impregnating is carried out at a temperature in the range of from
room temperature to 120°C using a solution of the ionomeric compound in
fluorinated organic solvent at a concentration in the range 1-20% by weight,
preferably 4-20% by weight till obtaining a until the membrane comprises
having the pores substantially filled by the ionomeric solution, the
impregnation is carried out at temperatures comprised between the room
temperature and 120°C, preferably between 15°C and 40°C;

- b) subjecting the so impregnated membrane is subjected to thermal treatment at
temperatures from 50°C to 200°C, preferably from 120° to 160°C till substantial
removal of until the solvent is substantially removed and the membrane is
obtainment of a substantially transparent membrane;
- c) optionally repeating step a) is repeated until the membrane appears substantially
transparent;
- d) treatment of treating the membrane obtained in a) with inorganic strong aqueous
alkali, preferably aqueous alkali, i.e. bases which are completely dissociated in
water, to obtain the conversion of convert the functional groups into hydrophilic
groups, preferably from SO_2F into SO_3^- , and of the COOR , COF groups into
 COO^- groups;
- e) treatment of treating the membrane obtained in b) with inorganic strong acids, i.e.
acids which are completely dissociated in aqueous solution, obtaining to convert the
(per)fluorinated ionomer to in acid hydrophilic form;
- f) optionally treatment of treating with water at a temperature temperatures in the
range of 50°C to 100°C to remove the excess ionomer 50°C–100°C, in case
repeated, until removal of the ionomer in excess and neutral pH of the washing
waters.

Claim 20. (Currently Amended) A The process according to claim 19, wherein in step
a) the organic solvent has a boiling point at room pressure lower than 180°C, preferably
lower than 120°C.

Claim 21. (Currently Amended) A The process according to claim 19, wherein ~~in step b) the used strong alkalis are the hydroxides~~ alkali is a hydroxide of the Group Ia metals.

Claim 22. (Currently Amended) A The process according to claim 19, wherein the at the end of step b) ~~washings with water are carried out until a neutral pH of the washing waters is obtained.~~

Claim 23. (Currently Amended) A The process according to claim 19, wherein the ionomer is crosslinked by adding cross-linking agents to the (per)fluorinated ionomer solution ~~impregnation solution a) crosslinking agents.~~

Claim 24. (Currently Amended) A The process according to claim 23, wherein the cross-linking agents are ~~crosslinking takes place by adding peroxides, and wherein the temperature of a cross-linking reaction is~~ to the impregnation solution and operating at temperatures from 100°C to 300°C.

Claim 25. (New) The method of claim 17, wherein the method of separation is microfiltration or ultrafiltration of aqueous solutions.

Claim 26. (New) The method of claim 17, wherein the method of separation is pervaporation.